

**SERVICE MANUAL
MODEL C16 COMPUTER**

Preliminary

OCT. 1984 PN-314001-03

 **commodore**
COMPUTERS

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OCT. 1984 PN-314001-03

Commodore Business Machines, Inc.
1200 Wilson Drive, West Chester, Pennsylvania 19380 U.S.A.

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C16 PRODUCT SPECIFICATION

MEMORY

16K RAM Standard

ROM

32K ROM Standard (includes operating system and BASIC interpreter).

MICROPROCESSOR

7501/8501 Microprocessor with a two speed clock (.89 or 1.76 MHz).

DISPLAY

40 Columns x 25 lines of text.

COLORS

121 Colors (15 colors; 8 luminance levels and Black).

CHARACTERS

Upper & lower case letters, numerals and symbols. Reverse and flashing characters. All PET graphic characters.

DISPLAY MODES

Text characters. High resolution graphics. Split screen text/high resolution graphics. MultiColor graphics. Split screen/multi-color graphics.

RESOLUTION

320 x 200 Pixels

SOUND

2 Tone generators or 1 Tone and 1 noise generator.

VOLUME

8 Volume levels

KEYBOARD

Full size/full stroke C64 style design.

KEYS

66 Keys total. 4 Cursor control keys. 4 Function keys (up to 8 user defined/programmable functions possible). Color control keys. HELP key. Upper and lower case character set.

INPUTS/OUTPUTS

Serial port. ROM cartridge and parallel disk drive port. 2 Joystick ports. C1531 Cassette drive interface port. RF Output — channel 3 or 4. Video output — composite/chrominance/luminance, audio input/output. Power supply input.

FEATURES

Built-in BASIC 3.5 — over 100 commands, statements and functions. Built-in Machine Language Monitor — over 12 commands. Built-in graphics and sound commands. Screen window capability. Extended screen editor.

PERIPHERALS

C1541 Disk drive, C1551 Fast Disk Drive, C1531 Datasette, MPS 802 Dot matrix printer, MPS 803 Dot matrix printer, DPS 1101 Daisy wheel printer, C1520 Plotter/Printer, C1802/1803 Color monitor, C1702 Color monitor.

**PARTS LIST
C-16**

TOP CASE ASSY

Top Case
Keyboard, 66 Key
LED Plate
Nameplate
Lamp Holder Set
LED Assembly

C 251813-01
C 251798-01
C 326160-02
C 251794-01
C 903820-03
C 1001039-01

BOTTOM CASE ASSY

Bottom Case
Foot, Self-Adhesive
PCB Shield Plate, top
PCB Shield Plate, bottom
PCB Insulation Sheet

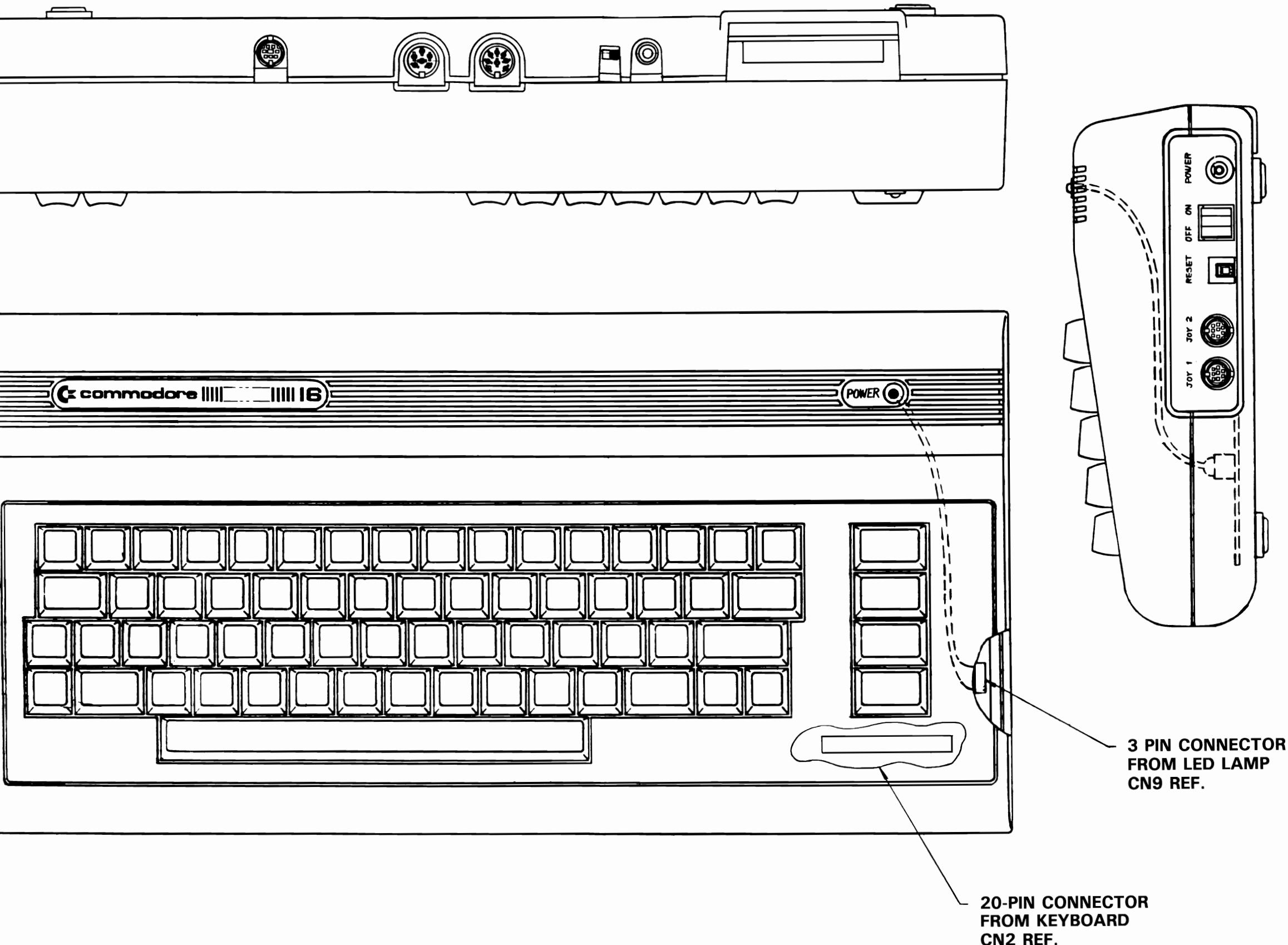
C 251790-01
C 950157-04
C 251795-01
C 251796-01
C 251797-01

ACCESSORIES

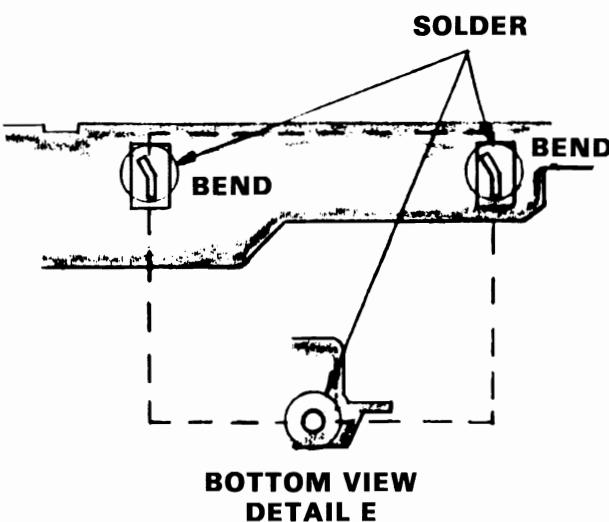
Users Manual
Power Supply
RF Cable
Switch Box

C 251799-01
C 251539
C 326189-02
C 904778-01

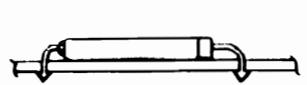
C — Indicates Commodore Stock Part



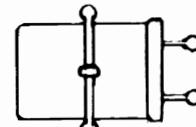
SEE DETAIL E
FOR -01 TO -03



BOTTOM VIEW
DETAIL E



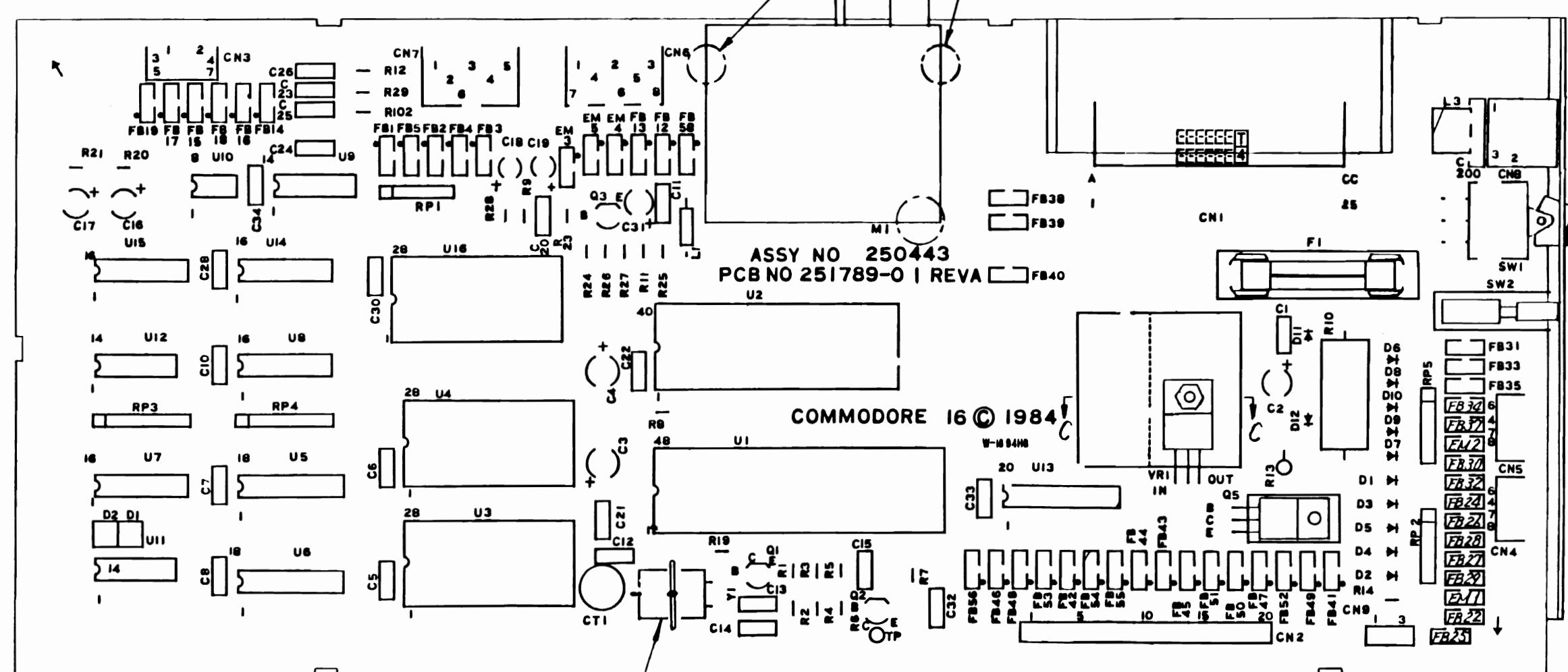
251081-01 SHOWN



251081-03 SHOWN

DETAIL A

SEE DETAIL A



PARTS LIST — C-16 PCB ASSEMBLY #250443-01

PLEASE NOTE: Commodore part numbers are provided for reference only and do not indicate the availability of parts from Commodore. Industry standard parts (Resistors, Capacitors, Connectors) should be secured locally. Approved cross-reference for TTL chips, Transistors, etc., will be available in manual form through the Service Department in November of 1984. Unique or non-standard parts will be stocked by Commodore and are indicated on the parts list by a "C".

| INTEGRATED CIRCUITS | | RESISTORS (Continued) | | | |
|---------------------|-------------------------------------------------|-----------------------|--------------------------|-----------|------|
| U1 | IC 7360 VSLI, Text Display (TED) C 251535-01 | R5 | 18K | R20 | 47K |
| | Sub: IC8360 C 251535-02 | R6 | 1.5K | R21 | 100K |
| U2 | IC 7501 Custom Microprocessor C 251536-01 | R7 | 470K | R23 | 10K |
| U3 | IC 23128 ROM TED Basic C 318006-01 | R8 | 1K | R24 | 1K |
| U4 | IC 23128 ROM TED Kernal C 318005-05 | R9 | 12K | R25 | 100K |
| | Sub: IC23128 C 318005-04 | R10 | Wound 20K 5W,10% | R26 | 240K |
| U5,U6 | IC D-RAM 16 x 4 251538-02 | R11 | 10K | R27 | 240K |
| U7,U8 | IC 74LS257 901521-57 | R12 | 3.3K | R28 | 1K |
| U9 | IC 7406 901522-06 | R13 | 470K | R29 | 100K |
| U10 | IC 555 901523-01 | R14 | 470K | R102 | 330K |
| U11 | IC 74LS125 901521-20 | | | | |
| U12 | IC 74LS02 901521-21 | | | | |
| U13 | IC 6529B Single Port Interface C 251640-03 | | | | |
| U14 | IC 74LS139 901521-18 | | | | |
| U15 | IC 74LS175 901521-34 | | | | |
| U16 | IC 7700-010 PLA C 251641-02 | | | | |
| TRANSISTORS | | | | | |
| Q1 | 2SC 1815 902693-01 | RP1 | 1K 6 PIN 0.19W 2% | 902441-22 | |
| Q2 | 2SC 1815 | RP2 | 3.3K 6 PIN 0.19W 2% | 902441-29 | |
| Q3 | 2SC 1815 | RP3 | 68K 8 PIN | 326149-06 | |
| Q5 | 2SD 880 902694-01 | RP4 | 68K 8 PIN | 326149-06 | |
| | | RP5 | 3.3K 6 PIN 0.19W 2% | 902441-29 | |
| DIODES | | | | | |
| D1—D10 | IN914B FORMING 251819-16 | C1 | Elect 1 μ F 25V | 900100-32 | |
| | Sub: | C2 | 47 μ F 25V | 900100-33 | |
| | 15953(3) FORMING 251819-07 | C3 | 10 μ F 25V | 900100-01 | |
| D11 | IN4001 900750-01 | C4 | 10 μ F 25V | 900100-01 | |
| D12 | ZENER RD 6.8EB 900927-01 | C5 | Ceramic 0.1 μ F 25V | 251075-06 | |
| | Sub: ZENER IN754A 900927-02 | C6 | Ceramic 0.1 μ F 25V | 251075-06 | |
| | | C7 | Ceramic 0.22 μ F 25V | 251075-07 | |
| | | C8 | Ceramic 0.22 μ F 25V | 251075-07 | |
| | | C10 | Ceramic 0.1 μ F 25V | 251075-06 | |
| | | C11 | Ceramic 0.1 μ F 25V | 251075-06 | |
| | | C12 | Ceramic 22 pF 50V | 251070-14 | |
| | | C13 | Ceramic 220 pF 50V | 251071-26 | |
| | | C14 | Ceramic 150 pF 50V | 251071-24 | |
| | | C15 | Ceramic 0.01 pF 25V | 251075-01 | |
| | | C16 | Elect 10 μ F 25V | 900100-01 | |
| | | C17 | Elect 1 μ F 16V | 900100-16 | |
| | | C18 | Elect 10 μ F 25V | 900100-01 | |
| | | C19 | Elect 10 μ F 25V | 900100-01 | |
| | | C20 | Ceramic 0.01 μ F 25V | 251075-01 | |
| | | C21 | Ceramic 0.1 μ F 25V | 251075-06 | |
| | | C22 | Ceramic 0.1 μ F 25V | 251075-06 | |

C — Commodore Stock Item

PART LIST – C16 PCB ASSEMBLY # 250443-01 (Continued)

| CAPACITORS (Continued) | | | | MISCELLANEOUS (Continued) | | |
|-------------------------------|--------------------------------------|-----------------|-------------|----------------------------------|------------------------------------------------------|-------------|
| C23 | Ceramic | 470 pF 50V | 251071-30 | | Cartridge Guide | C 310171-01 |
| C24 | Ceramic | 470 pF 50V | 251071-30 | | Connector Panel | 251791-01 |
| C25 | Ceramic | 470 pF 50V | 250171-30 | | RF Modulator | C 251844-01 |
| C26 | Ceramic | 0.1 μ F 25V | 251075-06 | M1 | | |
| C28 | Ceramic | 0.1 μ F 25V | 251075-06 | FB1-5, FB12-19 | | |
| C30 | Ceramic | 0.1 μ F 25V | 251075-06 | FB22, FB24-35 | Ferrite Bead | 325563-01 |
| C31 | Elect | 10 μ F 25V | 900100-01 | FB37-56, FB58 | | |
| C32 | Ceramic | 0.1 μ F 25V | 251075-06 | EM1-5 | EMI Filter | 251842-01 |
| C33 | Ceramic | 0.1 μ F 25V | 251075-06 | | | |
| C34 | Ceramic | 0.1 μ F 25V | 251075-06 | | | |
| C200 | Ceramic | .22 μ F 25V | 251075-07 | | | |
| CT1 | Capacitor, Trimmer | | 251029-02 | | | |
| MISCELLANEOUS | | | | | | |
| Y1 | Crystal 14.31818 MHZ – CL = 32 pF | | 251081-03 | CN1 | Connector, 50 PIN Female Edge, Expan. Gold Plated | 251630-02 |
| | Sub: Crystal 14.31818 MHZ | | 251081-01 | CN2 | Header Pin, 20 PIN, Keyboard | 903364-01 |
| L1 | Coil Inductor 1.2 uH | | 325570-01 | CN3 | Connector, 7 PIN MINI DIN, Cassette | C 251616-01 |
| L3 | Line Filter | | 251701-01 | CN4 | Connector, 8 PIN MINI DIN, Joy O Joy 1 | C 251259-01 |
| SW1 | Switch, Rocker (PC Mount) | | C 251587-01 | CN5 | Connector, 8 PIN MINI DIN, Joy O Joy 1 | C 251259-01 |
| SW2 | Switch, Push Button | | C 251260-01 | CN6 | Connector, 8 PIN DIN, Audio/Video | C 325573-01 |
| VR1 | Voltage Regulator 7805 | | 901527-02 | CN7 | Connector, 6 PIN DIN, Serial Bus | C 903361-01 |
| F1 | Fuse, Normal BLOW 250V 1.5A | | 903556-18 | CN8 | Connector Jack, DC Power, Power | C 251263-01 |
| F1 | Fuse, Clip | | 906102-01 | CN9 | Header Assembly, 3 PIN, LED | 903332-03 |

C – Commodore Stock Item

| PIN ASSIGNMENT | |
|-------------------|----|
| A2 | 1 |
| A1 | 2 |
| A0 | 3 |
| VDD | 4 |
| CS0 | 5 |
| CS1 | 6 |
| R/W | 7 |
| IRQ | 8 |
| MUX | 9 |
| RAS | 10 |
| CAS | 11 |
| φ0 | 12 |
| COLOR | 13 |
| CLK IN | 14 |
| K0 | 15 |
| K1 | 16 |
| K2 | 17 |
| K3 | 18 |
| K4 | 19 |
| K5 | 20 |
| K6 | 21 |
| K7 | 22 |
| SYNC | 23 |
| VSS | 24 |

U1-251535-01
VLSI, TEXT DISPLAY
(TED)

| PIN ASSIGNMENT | |
|-------------------|----|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| A5 | 7 |
| A4 | 8 |
| VDD | 9 |
| | |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |
| | 19 |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |

U1-251535-01
VLSI, TEXT DISPLAY
(TED)

| PIN ASSIGNMENT | |
|-------------------|----|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| A5 | 7 |
| A4 | 8 |
| VDD | 9 |
| | |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |
| | |
| | 19 |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |

| PIN ASSIGNMENT | |
|-------------------|----|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| A5 | 7 |
| A4 | 8 |
| VDD | 9 |
| | |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |
| | |
| | 19 |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |

| PIN ASSIGNMENT | |
|-------------------|----|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| A5 | 7 |
| A4 | 8 |
| VDD | 9 |
| | |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |
| | |
| | 19 |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |

| PIN ASSIGNMENT | |
|-------------------|----|
| A2 | 1 |
| A1 | 2 |
| A0 | 3 |
| VDD | 4 |
| CS0 | 5 |
| CS1 | 6 |
| R/W | 7 |
| IRQ | 8 |
| MUX | 9 |
| RAS | 10 |
| CAS | 11 |
| φ0 | 12 |
| COLOR | 13 |
| CLK IN | 14 |
| K0 | 15 |
| K1 | 16 |
| K2 | 17 |
| K3 | 18 |
| K4 | 19 |
| K5 | 20 |
| K6 | 21 |
| K7 | 22 |
| SYNC | 23 |
| VSS | 24 |

U1-251535-01
VLSI, TEXT DISPLAY
(TED)

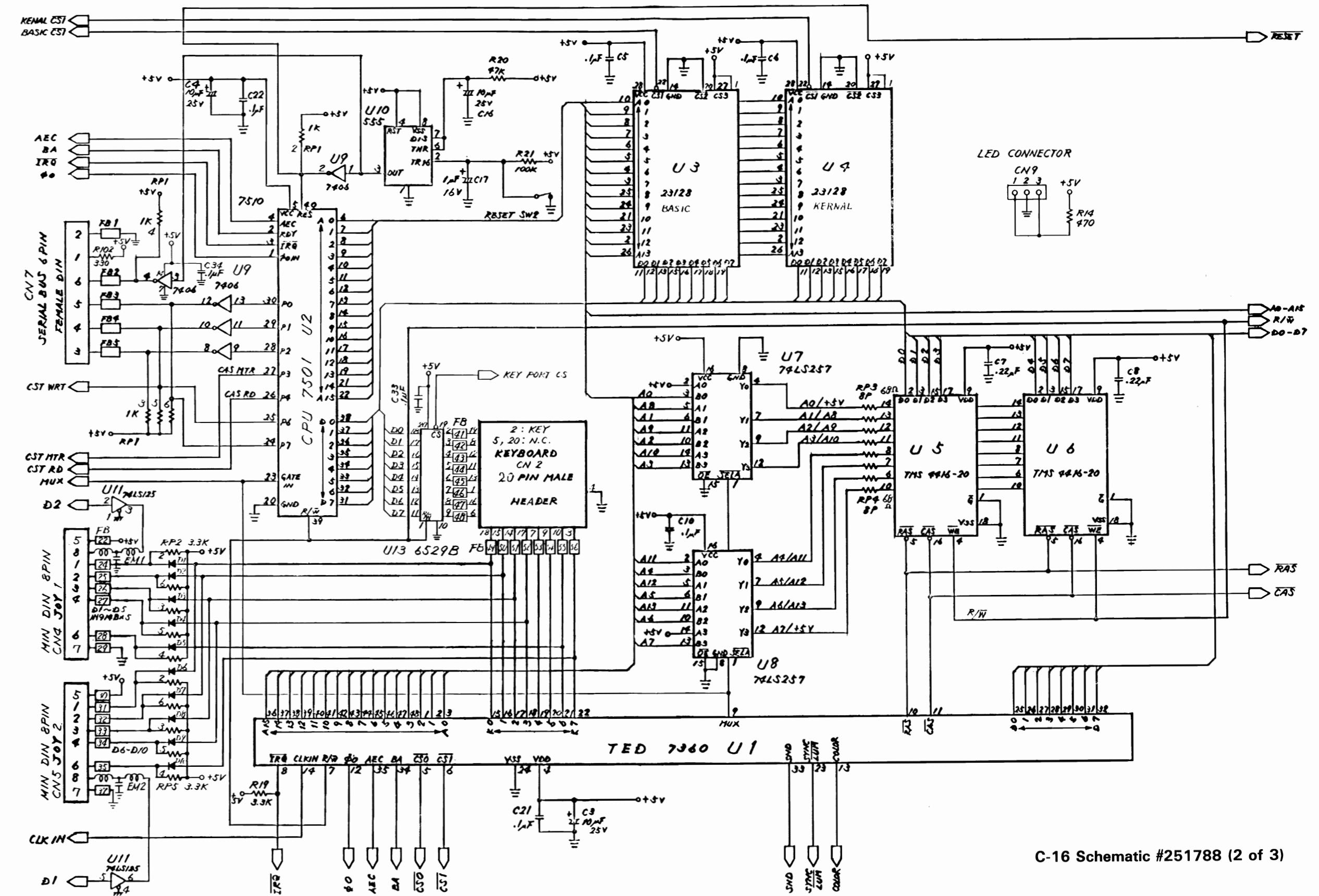
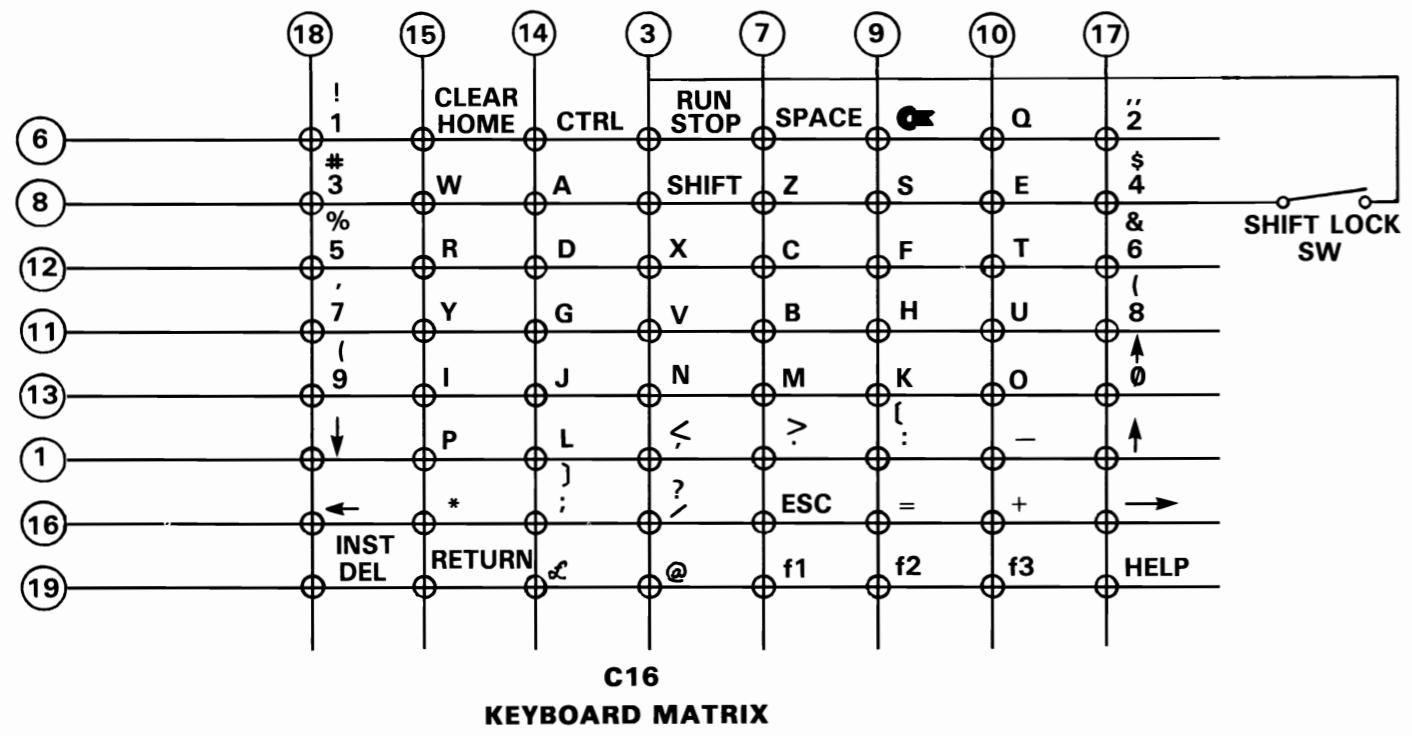
| PIN ASSIGNMENT | |
|-------------------|----|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| A5 | 7 |
| A4 | 8 |
| VDD | 9 |
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| PIN ASSIGNMENT | |
|-------------------|----|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| A5 | 7 |
| A4 | 8 |
| VDD | 9 |
| | |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |
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| | 19 |
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| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |

| PIN ASSIGNMENT | |
|-------------------|----|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| A5 | 7 |
| A4 | 8 |
| VDD | 9 |
| | |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |
| | |
| | 19 |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |

| PIN ASSIGNMENT | |
|-------------------|----|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| A5 | 7 |
| A4 | 8 |
| VDD | 9 |
| | |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |
| | |
| | 19 |
| | 18 |
| | 17 |
| | 16 |
| | 15 |
| | 14 |
| | 13 |
| | 12 |
| | 11 |
| | 10 |

| PIN ASSIGNMENT | |
|-------------------|---|
| ENABLE | 1 |
| D0 | 2 |
| D1 | 3 |
| WE | 4 |
| RAS | 5 |
| A6 | 6 |
| | |



| CS | R/W | D0-D7 |
|----|-----|------------------|
| L | L | DATA BUS TO PORT |
| L | H | PORT TO DATA BUS |
| H | X | ISOLATION |

L = LOW LEVEL
H = HIGH LEVEL
X = IRREVELANT

MOS 6529B 3 MHZ

PIN CONFIGURATION

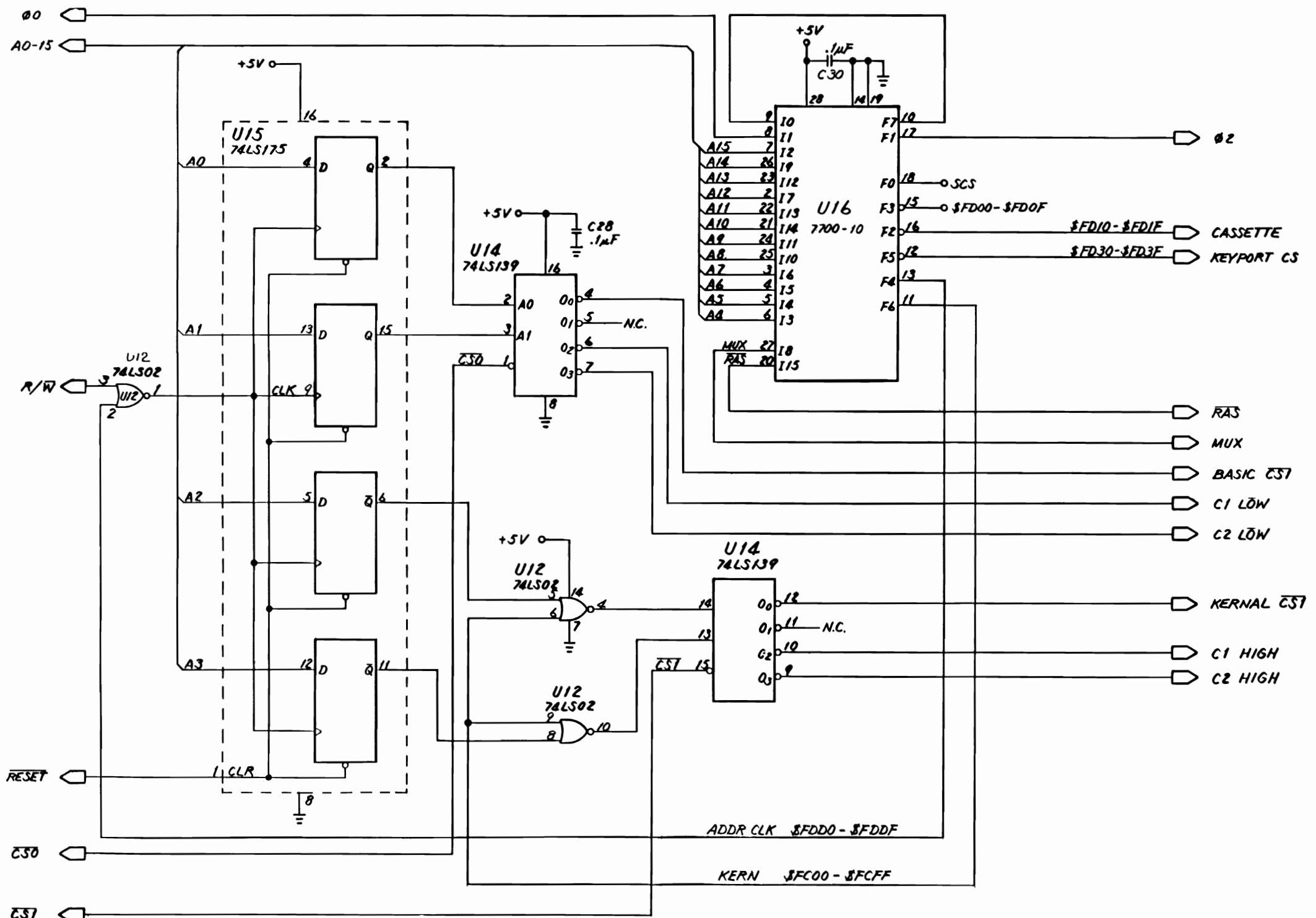
| | | | |
|-----|----|----|-----|
| R/W | 1 | 20 | VDD |
| P0 | 2 | 19 | CS |
| P1 | 3 | 18 | DB0 |
| P2 | 4 | 17 | DB1 |
| P3 | 5 | 16 | DB2 |
| P4 | 6 | 15 | DB3 |
| P5 | 7 | 14 | DB4 |
| P6 | 8 | 13 | DB5 |
| P7 | 9 | 12 | DB6 |
| VSS | 10 | 11 | DB7 |

U13-251640-03
SINGLE-PORT INTERFACE

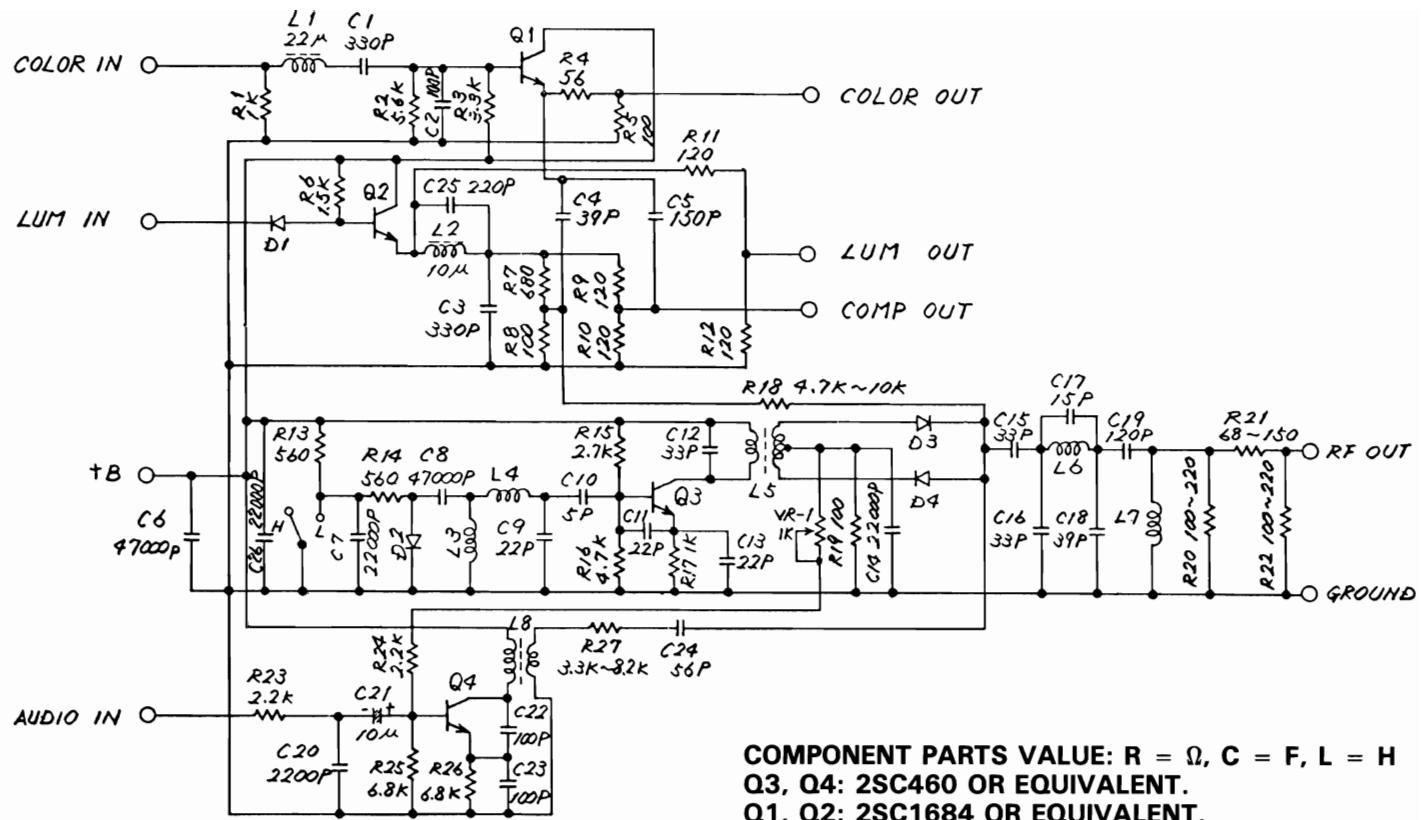
PIN CONFIGURATION

| | | | |
|-----|----|----|-----|
| FE | 1 | 28 | VCC |
| I7 | 2 | 27 | I8 |
| I6 | 3 | 26 | I9 |
| I5 | 4 | 25 | I10 |
| I4 | 5 | 24 | I11 |
| I3 | 6 | 23 | I12 |
| I2 | 7 | 22 | I13 |
| I1 | 8 | 21 | I14 |
| I0 | 9 | 20 | I15 |
| F7 | 10 | 19 | CE |
| F6 | 11 | 18 | F0 |
| F5 | 12 | 17 | F1 |
| F4 | 13 | 16 | F2 |
| GND | 14 | 15 | F3 |

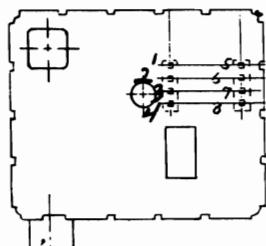
U16-251641-02
PLA



1. ALL RESISTANCE VALUES IN OHMS, 1/4W $\pm 5\%$.
NOTES: UNLESS OTHERWISE SPECIFIED —

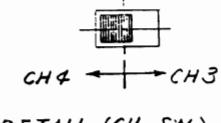


COMPONENT PARTS VALUE: R = Ω , C = F, L = H
 Q3, Q4: 2SC460 OR EQUIVALENT.
 Q1, Q2: 2SC1684 OR EQUIVALENT.
 D3, D4: 1SS198 OR EQUIVALENT.
 D2 : 1SS110 OR EQUIVALENT.
 D1 : 1SS119 OR EQUIVALENT.

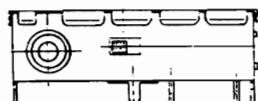


RCA. PHONO JACK

TOP VIEW



DETAIL (CH. SW)



REAR VIEW

| NO. | TERMINALS |
|-----|-------------------------|
| 1 | N.C. |
| 2 | AUDIO SIG. INPUT |
| 3 | +B (+5V) |
| 4 | SYNC + LUM. SIG. INPUT |
| 5 | COLOR SIG. INPUT |
| 6 | COLOR SIG. OUTPUT |
| 7 | COMPO. SIG. OUTPUT |
| 8 | SYNC + LUM. SIG. OUTPUT |
| 9 | RF OUTPUT |
| 10 | CHANNEL SELECT SW. |

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Service Documentation



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